

COMPUTER PLAN 1987-1990

Peel Board of Education
Computers in Education: 1987-1990

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SUMMARY OF RECOMMENDATIONS

It is recommended:

Recommendation 1: That the hardware purchases for 1987-1990 be planned (subject to budget) to lower the student/computer ratio in elementary schools to 30:1.

Recommendation 2: Since teacher training must parallel the placement of hardware and the in-service strategy should be based on a 'peer-coaching' model, it is recommended that release time be provided to each school on the basis of the per pupil formula in the elementary schools.

Recommendation 3: That hardware purchases for secondary schools be planned (subject to budget) so that GEMs are introduced for cross-curricular purposes into all secondary schools at a rate sufficient to reach a ratio of 50:1 student/computer by the end of 1990. These ratios would not include computer equipment assigned to Computer Studies, Keyboarding classes or Technological Studies.

Recommendation 4: That for each year of this plan, the maximum use should be made of the special R.E.E. grants assigned for computers.

Recommendation 5: Since teacher training must parallel the placement of hardware and the in-service strategy should be based on a 'peer-coaching' model, it is recommended that release time be provided to each school on the basis of a per pupil formula in the secondary schools.

Recommendation 6: That the 1987-1990 Plan provide for the purchase of GEM hardware to provide each secondary school with at least one Computer Studies lab with a network of 15 stations.

Recommendation 7: That hardware for Special Education and ESL/D continue to be purchased over the next four years to reach an average ratio of 12:1 in Special Education and ESL/D classes by 1990.

Recommendation 8: That, phased in over the period of the Plan, one Field Computer Technician per superintendency be hired to take responsibility for the maintenance and management of technical needs of the Board's hardware inventory.

Recommendation 9: That a plan and budget be developed in 1987-88 to begin the systematic cabling of GEMs in schools, to provide the ability for school computers to communicate with each other, with other school locations within Peel or with data bases external to Peel.

Recommendation 10: That a process for evaluation of the objectives of this Plan be developed in conjunction with the Research Department and that a summative review be conducted in the 1989-90 school year.

INTRODUCTION

The computer is a machine which has already begun to change our world with an impact equivalent to the invention of printing or the steam engine. Its influence and its potential to affect all we do makes us both hopeful and wary. As educators, we have had to develop not only new understandings but also make decisions and establish systems that we know are likely to be tentative. The best planning for the use of computers, whether in an office or a home or a school must be understood as an exercise in exploration, with risk and yet with intense excitement. The Peel Board of Education embarked on a three-year plan in 1983 with a good understanding that orientation to the computer throughout the school system was critical; as well, it was determined that a foundation would be needed before widespread and sophisticated use of computers could occur in Peel schools.

Development of that foundation involved commitments to providing Program staff, to hardware purchasing that was weighted towards the secondary schools, to curriculum development, and to the acquisition of software. It required extensive staff development for both those who were anxious about computers but also to create a corps of leaders who could assist their colleagues and establish good new programs to learn about computers, particularly in Grades 7-13. Appendix 1 describes the original plan and Appendix 2 provides important data on how learning about computers and learning with computers is occurring in our schools.

The value of the computer lies in its potential to enhance the power of the learner, as well as the teacher. The computer can give a person access to a new world of immediately updated information; it can help us store information in great quantities and permit the fast recall of information in many different ways. Any person, at almost any age, can manipulate information to develop new patterns of understanding.

Beyond this, the computer makes it possible for us to problem-solve in ways we either didn't know or couldn't afford a few decades ago. It is an instrument of communication. As an instrument of production, it enables us to print and revise documents through word-processing, but also can generate blueprints, models, image and music.

Today, one could hardly argue that the computer is essential to every learning task or problem-solving activity, yet it is rapidly becoming as integral to our lives as the watch, the telephone, the radio and television. Any instrument of such power must be treated with respect but also with caution. Our students need to know about computers and what they can do, they also need to learn how to amplify their own learning through the use of a computer whether it be at home, in the library, in the classroom, or in a specialized lab-setting. To assist with these processes and enhance their own opportunities to be more productive, teachers also need to be knowledgeable (at various levels) as well.

Two cautions are needed. The computer can generate time for many things. If the time it saves leads only to more intense computing, problem-solving and production rather than to the enhancement of our understanding of life, art and humanity, we will suffer as a society. If it only complicates communication and decision-making, it will be a problem rather than a boon.

As well, our democratic society could be severely affected if the power of the computer is used to enhance the power of particular economic, intellectual or social groups. The public school system is itself an institution devoted to supporting the health of our democratic society. We cannot ignore our responsibility to teach about it and use it to teach, virtually throughout the school system.

This report sets out a second three-year plan. That plan is an extension of the original plan but it incorporates assumptions:

- while a foundation has been established, further support services will be needed to maintain it;
- while much has been accomplished, it is necessary to focus our activities on the provision of basic understandings and skills in the elementary panel, through continued expansion of our hardware, software, curriculum development and staff development activities;
- there is a need to focus our energies in the secondary panel on the specialized uses of computers for business, mathematics, technological studies, computer science and libraries;
- there is a need to encourage cross-curriculum use of computers in secondary schools with the expectation that they will become an integral part of every instructional situation within the next five to seven years;
- there is a need to recognize the special value of computers to assist language-learning and problem-solving for exceptional pupils and those who are learning English as a second language.

This report recommends significant expenditures to support these thrusts but is relatively cautious with respect to hardware purchases over the next four years. A ratio of 25 student to a computer would likely be the optimal objective for the next four years; this plan uses more conservative ratios but if costs were to drop or grants improve significantly, recommendations to adjust this plan would likely be forthcoming.

KEY INITIATIVES

The Peel Computer Plan - 1987-1990 - is built on the foundations laid by the first plan which covered the three years from 1984 to 1986. In the early stages of computer introduction to a school system, it is appropriate to make a positive statement but to move with a pace moderate enough to accommodate the need for balance among the key elements of teacher preparation, software accessibility and the acquisition of hardware. The first Peel Plan provided that introduction. Working from that base, Phase Two has four major initiatives:

To continue the focus on integration of computers into the curriculum and classroom practices in Peel.

- This continuing initiative begun by the previous plan will require a significant effort to develop teacher effectiveness in the use of computers and to incorporate computer resource materials as components of other curriculum documents in Peel.

To improve the accessibility of computers to students in Peel through the reduction of student to computer ratios for all components of the student population.

- The acquisition of hardware has to continue to build but should not exceed the ability of the system to absorb the equipment in terms of teacher training, software, and support system.

To provide the support services needed by the expanding computer inventory and level of teacher involvement.

- Attention must be given to the continued development of the software inventory, the maintenance and repair of the computer equipment and the planning of a long term replacement policy.

To continue the development of networked computer systems in Peel - particularly the in-school networks of GEMs.

- The vision of a networked school system incorporates the DSS and DES strategies, library automation, student access to external resource data bases and professional resource links for teachers within Peel.

This second plan is based in part on the results of a review of the Phase One Plan (Appendix 2) and will itself be reviewed in 1989/90. Peel has developed its computer strategy in the light of information gained from contacts with outside sources. Continued efforts will be made to monitor Ministry of Education directions, province-wide trends and the broader perspective of national and international achievements.

RATIONALE FOR A SECOND COMPUTER PLAN FOR PEEL

The integration of computers to the instructional program in a school system must be viewed as a process. The first three year Computer Plan recommended those steps necessary to seed and support initial computer activity among teachers and evaluate those aspects of the curriculum which would benefit most from this most powerful learning tool. In parallel with early steps in teacher training and software acquisition, that report called for a steady accumulation of a hardware inventory in the Peel system. The goals set for hardware numbers were met and provide a good basis on which to build in the second three year phase.

Several factors contribute to the long term nature of computer integration:

- hardware is a high capital expense and must be spread over a 9 or 10 year period;
- each computer-using teacher will need about three years of frequent training and support before computers will be seen as a integral part of classroom process;
- teacher involvement is uneven so while many will be already integrating computers into classroom activities, some are yet to start the three year process;
- different types of applications are being adopted at different rates -- some delayed because of unique software or hardware requirements, others because of the specialized teacher training necessary;
- full integration in any classroom setting is dependent upon the links established to curriculum, the development of curriculum materials and the time required for any curriculum change to take place;
- hardware needs to be available at the time of or immediately after training or the concepts and skills taught are never reinforced and are easily forgotten, so the rates of hardware acquisition hold back integration in some situations.

Phase one of the Peel computer integration process was characterized by high energy among lead teachers, entrenching of guaranteed programs such as computer studies and experimentation, with classroom applications in all disciplines at all levels. Most applications produced very positive results and generated an eagerness to proceed with more widespread integration and competition for hardware resources. In some instances the feedback, while positive for the long term, suggested a need for a more paced introduction and more careful analysis of learning impacts.

Teacher enthusiasm for computer use during the last three years is reflected in the percentage of the academic staff (approximately 60%) who attended for Peel's Computers and Educators evening courses. This series of in-service workshops was designed to provide teachers with introductory computer competencies and help them understand how computers could be used in classrooms. As computers became more accessible, in-service activities have adjusted to provide more curriculum specific workshops -- where possible, organized in conjunction with other Program Department staff.

The next computer plan needs to evolve from the first and build on the groundwork already laid

particularly by expanding initiatives in the area of curriculum integration of the computer activities. This integration should be designed to work towards equity of opportunity for students in Peel to use computers in the study of subjects for which particularly effective results have been found. Such equity rests more on the success of teacher training programs than simply on the availability of hardware so the new plan must emphasize strategies for teacher in-service. In-service activities will be focussed on methodologies for integrating computer use into curriculum and any development of specific computer competencies will be in the context of preparing to use the curricular computer materials.

The major goal of curriculum integration will require the coordination of all the curriculum resources of the Board. The structure of curriculum support already in place in Peel involving the Program Department, and the Field Office resource staff, should become the network for computer integration support as well. Co-ordinators and regional consultants should participate in the preparation of computer resource materials which relate to Peel computer initiatives and help to plan the in-service process. Resource teachers will need to provide the important link directly to the teachers by conducting the in-service sessions and providing support as they work with teachers right in the classrooms.

The first phase of the Peel computer plan emphasized the need for the development of a software inventory for our schools. The demands for software purchase will continue but several factors change its relative importance:

- the Ministry of Education is providing software free to Ontario schools which have GEM equipment;
- we have already developed a significant base of software in schools and the circulating library helps to make access equitable;
- the greater versatility of more recent software developments allow a single piece of software to be applied effectively in many learning situations;
- future hardware expansion will eventually multiply the number of computers available in a given setting but make use of the software already in place.

The number of academic staff which need to receive computer curriculum training is large and the time required to adequately prepare each person is considerable. But to do less is to ensure less than maximum use of computers -- not so much in terms of the time computers are in use, as in terms of the quality and effectiveness of the learning opportunities which are offered.

With these many factors in play, the next computer plan for Peel has been built around the following assumptions:

1. the Peel Board should make the maximum use of Ministry funding and use regional funds to buy GEMs for as many applications as possible;
2. the development of computer literacy skills and understandings in Peel students continues to be an adjunct to and by-product of the use of computers in a variety of ways to achieve other curriculum objectives;

3. equity of opportunity to use computers in learning and to develop computer-related skills is a goal of the Peel computer plan;
4. the momentum of hardware acquisition should not be lost and purchases should continue in phase with programs to train teachers and to develop curriculum related materials;
5. computer use in the curriculum should move towards being an integrated methodology of overall curriculum delivery and the existing program support structure should be, as much as possible, the vehicle for implementing computer strategies.

A. Applications for Elementary Schools

Hardware Strategy

Recommendation 1: *That the hardware purchases for 1987-1990 be planned (subject to budget) to lower the student/computer ratio in elementary schools to 30:1.*

A reasonable goal for the acquisition of hardware by 1990 should be to increase the inventory to the equivalent of one per classroom and one in the library of every Peel elementary school. The rate of purchase recommended in this Plan will probably still leave Peel at the lower end of a list of Greater Metro Boards in terms of the level of computer access in the elementary panel.

The initiatives of the Ministry of Education for Ontario to set hardware specifications for educational environments and then to fund the shared purchase of such equipment, has proved successful. Elementary schools, where the use of the GEMs was piloted, both in Peel and in other parts of the province, have had very positive experiences with the classroom use of computers. Prior to 1986, Peel had committed only as much funding as needed to set up a several test sites in both elementary and secondary schools.

Current models of computer equipment have been very valuable to Peel in allowing a rapid increase in computer accessibility. The versatile nature of those computers will make them important aspects of our computer picture into the 1990s. However, for longer projections, networked arrangements of GEMs with software designed for Ontario schools offer a better hardware alternative for a long term program.

Networked computers can not be distributed one or two a year to a school because of the disproportionate cost of a fileserver. For the next four year plan, the GEMs will have to be placed in a smaller group of schools each year with a goal to reach all elementary schools by the end of the fourth year.

Distributing the hardware to a limited number of locations each year of the plan makes it possible to co-ordinate the provision of adequate training and support to teachers. To provide classroom teachers with daily support and to focus frequent training sessions in the school setting, a 'peer-coaching model' will be used for computer integration. In each school, one teacher, with a strength in curriculum and adult education training as well as competence with computers, will be identified and given sufficient initial training and then provided with release time to help colleagues.

Recommendation 2: *Since teacher training must parallel the placement of hardware and the in-service strategy should be based on the 'peer-coaching' model, it is recommended that release time be provided to each school on the basis of the per pupil formula in the elementary schools.*

Since the attitudes and support of the levels of administration are key to the success of any innovation in education, a program of in-service will be provided for superintendents, principals and vice-principals for the curriculum applications being introduced.

B. Secondary Cross-Curriculum Applications

Hardware Strategy

Recommendation 3: *That hardware purchases for secondary schools be planned (subject to budget) so that GEMs are introduced for cross-curricular purposes into all secondary schools at a rate sufficient to reach a ratio of 50:1 student/computer by the end of 1990. These ratios would not include computer equipment assigned to Computer Studies, Keyboarding classes or Technological Studies.*

Recommendation 4: *That for each year of this plan the maximum use should be made of the special R.E.E. grants assigned for computers.*

The number of computers needed for different types of cross-curriculum applications varies widely on a continuum from the 1:1 ratio necessary for some computer-delivered courses to, at the other extreme, only occasional access to a small number of computers. The current inventory of computers in use in cross-curriculum applications only in Peel is 420 -- an overall ratio of 79:1. However, when computers are grouped in significant numbers for some classrooms such as those for some Business Studies courses, the statement of a ratio does not adequately represent the real accessibility of students to computer applications for other subjects. Therefore the calculations for purchases have been based on two concurrent strategies. The provision of 130 units in each year of the Plan will lower the ratio for cross-curriculum applications to 50:1 by 1990 and assist in the provision of equipment at adequate levels for computer-delivered courses in Business Studies.

The GEM systems have demonstrated considerable potential for use with cross-curriculum applications. The added promise of 800 pieces of high quality educational software from the Ministry at no direct cost to Peel by 1990 underlines the advisability of Peel using every opportunity to build towards a networked-school model based on GEM equipment. The long term vision of a networked school with computers available for curricular support in most classrooms and in central study locations directs this next phase of computer placement and acquisition in Peel. To that end, in each year of this Plan, application should be made to the Ministry for the maximum allowable grant for GEM purchases.

Currently there is a wide range of types of computers in use in Peel secondary schools. This situation developed because of the rapid changes in hardware capability which have occurred over the last few years plus the pilot strategy which has been used to introduce computers into the secondary panel. Those computers will continue to be of value to the system and will bring computer potential to many aspects of the school program. As GEMs become available more generally in schools, the existing hardware will continue in its current assignment or be reassigned to areas which can make the best use of its capabilities.

In some specific settings, stand alone computers will remain the best choice for curricular purposes. This will occur in cases where computers are called on to link to other equipment or where specialized software is not available for GEM equipment. For the short term, some purchases may need to be made to meet these needs but the selection of alternative hardware and software should be

consistent and compatible for a particular subject area so that support services and curriculum initiatives can be provided equally to all locations.

Curriculum Directions

During the last three years, pilots have been supported in all subject areas of the secondary panel. A great deal has been learned about the strengths of computer support in each of the areas; but, some applications are more ready to participate in a major initiative for 1987 than others. While the support of evaluative and innovative activities must continue to be supported and assessed, the most efficient and effective integration will be achieved if only a subset of subject areas are given focus in each year of the Plan.

Over the next four years, probably all subject groups will qualify as ready for particular attention; but, in the current situation, language skills development in terms of creative writing, communication skills and language manipulation offers the greatest potential for gain from a co-ordinated project involving hardware, curriculum materials and in-service. A focus in this area will also blend with the expansion of current computer resources in the library to include a network link to the classrooms.

Where programs are already underway in other subjects in a school, support will continue to be provided in terms of software acquisition and teacher workshops. If particular applications require alternative equipment, regional funds could be used to expand those initiatives for which curriculum support materials are available and appropriate in-service activities are possible.

In-service plans

Recommendation 5: *Since teacher training must parallel the placement of hardware and that the in-service strategy should be based on a 'peer-coaching' model, it is recommended that release time be provided to each school, on the basis of a per pupil formula in the secondary schools.*

In-service for computer use at the secondary school level must continue to be directed at curriculum implementation. Teachers will develop computer competency skills as they require them to make use of a computer in some way for their students. A subject-centred coaching model will be used to provide the essential direct curriculum links.

Each school, in addition, will be called on to set up an in-school coaching system to provide support for the general classroom methodologies and the networked concepts which are internal to each school environment. The school librarian should be linked to both layers of in-service -- the curriculum specific and the in-school strategies.

C. Computer Studies

Hardware Strategy

Recommendation 6: *That the 1987-1990 Plan provide for the purchase of GEM hardware to provide each secondary school with at least one Computer Studies lab with a 15 station network.*

Computers required for classrooms in which Computer Studies courses are taught have always been understood to be the first priority for the computer budget in Peel. That approach has produced a situation in which our schools are relatively well equipped in terms of numbers of units. The sanctioning of an OAC course and advances in the quality of senior division course outlines make it necessary to set a minimum of one GEM Computer Studies lab as a goal for the Peel system.

GEM equipment has been used extensively and successfully over the past two years in Peel schools for Computer Studies. Many features of the GEMs and the software written for them provide opportunities for extension of the curriculum from the way it has been delivered on 8-bit computers. Every school offering senior division Computer Studies should have access to at least one lab of GEM equipment. Central management of equipment will enable newer generation hardware to be phased in for use with OAC courses where they are offered.

Curriculum Directions

The Ministry has contracted for the development of software particularly suited to the Computer Studies courses. These materials will be available at no direct cost to the Board in the near future and should become the focus of resource material development and in-service. Some additional software is already being developed by third party companies and, where justified for the curriculum, these materials should be acquired centrally for use on the networked systems.

The Grade 10 Introductory Computer Studies course involves a survey of the types of computer applications in education, business and society in general. The enrolment has been high for this cross-discipline course, but the need for students to have such an overview will lessen as students from the elementary panel arrive with computer competencies already in place and as more teachers of other subjects at the secondary level introduce computer use in their classrooms. As these changes occur, the Peel course outline will be adapted to the new conditions while maintaining the spirit of the Ministry Guideline.

In-Service Implications

Most Peel secondary schools already have one or two key Computer Studies teachers. It is necessary to provide these people with continuous up-grading so that they can better act in a support role for their colleagues. New software/curriculum materials will be in-serviced first with these people and then on-going up-dating provided in release time so that they can keep the staff at their school current.

It is anticipated that during the period of the next Computer Plan, Computer Studies course will undergo significant change. Changes in the Ministry Guideline or the acquisition of more appropriate

software which result in new or different skills or knowledge requirements on the part of Computer Studies teachers, will be responded to with the development of curriculum materials and the delivery of corresponding in-service programs.

D. Special Education / ESL/D

Hardware Strategy

Recommendation 7: That hardware for Special Education / ESL/D continue to be purchased over the next four years to reach an average ratio of 12:1 in Special Education and ESL/D classes by 1990.

The use of computers with students in Special Education and ESL programs in the Peel sites which have been provided with equipment has provided very positive feedback. It is intended to expand the hardware inventory for these applications in parallel with that for other instructional areas.

In the short term, hardware purchases should be consistent with the stand alone type currently in use. As schools increase the scale of the cross-curriculum networks and as more specific software becomes available, special classrooms should be provided with GEMs.

Teachers of ESL/D classes or of Special Education students need the support of the in-school computer coach in the same way as other teachers. In addition, specific curriculum applications and strategies for classroom management techniques appropriate for specific students will come from the existing resource structure in those areas, i.e. the resource teachers and the regional staff. To that end, resourcing of computer materials is necessary for the resource staff first and then through them to the teachers during in-service sessions.

E. Support System for Computer Education in Peel

E.1 Integration of Resource Networks

To facilitate the circulation of curriculum software from a regional library, a computer-based catalogue will be developed which in the short term will be distributed to all schools but by 1989 will be available on line.

The mixed pattern of computers in Peel secondary schools has served the Board well in that teachers have had opportunities to introduce computer activities for the type of software available for their subject. As GEM equipment is purchased for cross- curriculum applications, some of this hardware will be displaced. The hardware still has value but not perhaps in its current curricular setting. There is an expectation that principals will develop a process for the reassignment of computer resources within a school. There also is a need to ensure that all regional budgets which are used to purchase computer equipment are co-ordinated in both planning and spending to address the system needs.

E.2 Technical Support

Recommendation 8: *That, phased in over the period of the Plan, one Field Computer Technician per superintendency be hired to take responsibility for the maintenance and management of technical needs of the Board's hardware inventory.*

A major concern with respect to the hardware inventory in Peel is the issue of repair and maintenance. Many of the computer components which are sent out require only minor repairs but, by the present arrangements, all faulty equipment must be taken to an external repair company. The lengthy turn around time, equal for all problems, seriously affects the programs in the schools. An in-house repair shop to handle all but the most complex breakdowns should be in place in the fall of 1988.

Computer equipment also can be kept functional and more problem free with a series of maintenance steps conducted on a regular basis. Some of these are routine and could be done by academic staff with a little guidance. More technical maintenance should be done by trained personnel. The same level of support personnel expertise is needed to supervise the set-up of equipment, do the cabling of schools for network systems and act as a resource to academic staff with respect to simple hardware competencies.

As the inventory of networked computers expands, the need for technical support at the school level also will increase. The 43 new instructional networks recommended in the first year of this Plan create a demand for set-up support (a minimum of two days per school) and frequent contacts to ensure that the system is running smoothly and to back up the teachers who have taken the responsibility of site administrator. It will not be possible to maintain the current number of computers and add new equipment without appropriate technical support. The hardware investment of approximately \$2 M by the end of 1986 and the addition of another \$4.5-5.5M by 1990 should be protected. The eventual

number of technicians should be one for every superintendency; but, this service should be phased in as the number of computers grows.

Field Office Computer Technician: Job Functions

This person would be:

- supervised by the Superintendent of Schools;
- work co-ordinated by the Computer Centre Staff in the Program Department at the H.J.A. Brown Education Centre.

Duties:

- set up and maintain computer equipment networks in schools;
- maintain inventories of hardware;
- update operating software on networks in school;
- perform routine maintenance procedures on computer hardware and operating system software;
- do simple repairs and replacements to printers and computer equipment;
- direct equipment for repair and monitor repair processes;
- support site administrators by installing software and login files on hard disks;
- appraise technical needs for the families of schools to ensure optimum use of equipment.

E.3 A Networked School Board

Recommendation 9: *That a plan and budget be developed in 1987-88 to begin the systematic cabling of GEMs in schools, to provide the ability for school computers to communicate with each other, with other school locations within Peel or with data bases external to Peel.*

As GEMs are introduced to new schools or expanded at existing sites, cables must be installed to link the user stations to each other and to the file server. Within reason, the initial cabling should anticipate the locations where the computers might be placed for student access. Computers can be relocated each year within a school to accommodate shifts in student use if the appropriate cabling has been done.

The concept of a networked school within which resources are shared and where students can access their own work from any location can be extended to the scale of a school board. Already, initial steps have been taken to enable librarians to exchange information among the schools via a computer bulletin board and plans have been presented to an integrated Peel library cataloguing system.

Cabling of schools for the networks will also allow student access to resources beyond the school and, at another level, external to the Board.

Peel is participating in a province-wide pilot of RBCS (Remote Broadcasting Communication System) which will enable data to be transmitted between schools within a board, between boards or with other institutions such as TVOntario. In parallel with the RBCS pilot is an opportunity to evaluate a conferencing system, CoSy, for exchanges with administrators or resource people in other boards. Peel's own communication system, PENIBB, is an integral part of the current and future pattern of a networked school board and has already been purchased by approximately 15 other school boards in Ontario.

E.4 Library Automation

Consultants' Report: 1985

A special project in the Computer Education budget in 1985 for a study by external library automation consultants resulted in the Report, Library Automation in the Peel Board, by Strangways, Stevens and Associates.

The contents and recommendations in that report have undergone further study based on the most recent developments in the field of library automation and a report accompanies this one.

In essence, that report confirms the Consultants' recommendation to automate the access to our school library holdings in Peel. The automation involves changing the present card catalogues in all our school libraries (K-13) to electronic data based catalogues similar to those used both in public libraries and college and university libraries. The J.A. Turner Professional library is also preparing an electronic catalogue of its collection.

The primary rationale for the change is to provide students in Peel schools with more complete access to the resources in their own library. An electronic data base allows the use of better strategies for research and thus a more efficient use of the materials in each resource centre. Conversion of our libraries to an automated data base system will provide our students with training and hands-on experience in the use of large data bases - - one of the recommendations of the O.S.:I.S. Guidelines. The present cataloguing system based on card files can not be used to teach students the skills necessary to access the types of automated systems already in place in other library systems which our students use or will soon use.

E.5 Review and Evaluation of the Computer Plan

Recommendation 10: *That a process for evaluation of the objectives of this plan be developed in conjunction with the Research Department and that a summative review be conducted in the 1989-90 school year.*

E.6 Administrative Networks

The schools in Peel are being linked together in an administrative network. By the end of 1986, all but five of the secondary schools have the necessary hardware and communication links to be part of the DSS (Distributed Secondary System). A budget request will be made in 1987 for the resources needed to join the remaining schools.

Currently schools on the DSS have access to software to handle scheduling, mark reporting, and student data base management. At the moment, these facilities are all used on site at the schools except for the use of a telephone link to upload information from the schools for report card production which is then handled on the mainframe at H.J.A. Brown Education Centre. A fourth component of the DSS package -- an attendance program -- is currently being piloted at Chinguacousy.

The development of a full K - OAC student data base will allow the network to transfer data from one location to another, particularly from one panel to another and for Superintendents to tap portions of the data base for their administrative purposes.

The DES (Distributed Elementary System) is a replication of the DSS involving only those components appropriate to administration in elementary schools. The major use of the network links will be for the management of the K-OAC data base. Schools will hold their own student information in the school and upload data as it is required, possibly to the field offices which would become intermediate nodes on the full board-wide network. At the moment, the DES is being piloted at four locations using ICON computers as the in-school hardware. Plans for expansion of this system are still under consideration as evaluation is being conducted at the pilot schools.

APPENDIX 1
BACKGROUND TO
THE COMPUTER PLAN 1987-1990

BACKGROUND TO THE COMPUTER PLAN 1987-1990

In late 1983, the Program Committee of the Peel Board accepted a report which provided the basis for three successive years of budget expenditures related to computer use for instructional purposes. The Computer Plan - 1984-1986 subsequently received full Board approval and each year has been supported to the extent of the budget allotment recommended in the Plan. This current document presents a rationale and a structure for a second three year project to continue the process of integrating computer use in Peel schools.

The first report in 1983 was presented in the context of a Board for which the major use of computers at the time was in secondary courses for Computer Studies; the focus in teacher training was on a series of teacher-paid workshops to provide computer hardware competencies; software was mostly public domain and of inconsistent quality; and a large majority of all elementary computers were purchased by non-Board funds. The Computer Plan 1984-86 was based on a number of thrusts designed to address the immediate needs of 1984 in a framework which would allow for long term growth:

- Computer Studies expenditures would be the highest priority in the first year but would decline in proportion as the student numbers leveled off and the equipment needs were met.
- Computer applications in other subject areas in secondary schools would be evaluated through a series of pilots.
- Computers would be provided to elementary schools on an equitable basis to lower the student/computer ratio toward a goal of 100:1 or one computer to every three classrooms.
- The Ministry of Education had just undertaken a commitment to support the acquisition of hardware specifically designed for long term use in education and the development of software for Ontario curricula. In Peel those initiatives would be monitored and evaluated. Purchases of GEMs were to be made in parallel with stages of proven value in Peel schools.
- Computer-based services (such as InfoGlobe data base access and CHOICES career planning) for students would be piloted and, if found appropriate, later distributed so that all Peel students would have access.
- Teacher training courses were to be continued through the R&R (Retraining and Recertification) program but re-evaluated annually to adjust to the changing needs of Peel teachers.
- A teacher computer centre was to be set up to focus software evaluation, acquisition and dissemination processes and to provide the nucleus for a support system for computer-using teachers.

Although smaller scale initiatives were added over the three year period to accommodate fluctuations in the rate of computer growth and advances particularly in the area of software, the major thrusts of the first Plan were carried through and their objectives achieved. Research was conducted in the spring of 1986 to gather data on the extent and nature of computer use in Peel. The results of that survey, which are summarized in Appendix 2, were used as the basis for preparing the second Plan.

In terms of specific benchmarks, the goal of a 100:1 ratio of students to computers in the elementary panel was achieved and exceeded. A drop in computer tender costs permitted a reduction to 75:1 maximum in all schools. The objective to build software inventories in schools was addressed by distribution strategies such as "Disk of the Month", bulk purchase ordering and direct provision of selected commercial software. Participation in the ALSBO software project added to the stock of good curriculum software materials and the growing collection of Ministry funded packages is starting to have a major positive impact on applications in schools which have GEM hardware.

While the inventories of computers in total are significantly larger in the secondary panel, the majority of units is still in Computer Studies classrooms. The computers available for cross-curriculum use also tend to be concentrated in a small number of subject areas leaving nearly half of the secondary teachers with no opportunity yet to use computers. While the distribution of hardware among secondary schools has been equal over the three years of the first Plan, the pattern of use varies widely both in terms of the subject areas involved and the location of the computers. Some schools have focused on a computer resource room available to all classes, others on placing computers in specific classrooms to directly support curricula, but most schools have used both strategies in parallel.

Counselling departments in all Peel secondary schools now have access, in-house, to CHOICES and all library resource centres have the ability to provide student research opportunities through Info Globe. In the latter case, while the capability is there, the level of use varies across the region, usually responding to the readiness of subject teachers to incorporate the strategy into their course activities.

The long term process of integrating computer use into classroom methodology to support curriculum objectives and learner needs has begun under the first Plan. Peel teachers are attending an increasing number of workshops, on P.A. Days and at conferences, at which they are shown ways in which computers can be used to address objectives taken from Peel curriculum documents. Even more specific applications are being incorporated into Peel courses and resource materials as they are developed. For example, the new Music curricula for Grades 4 and 7 and the Special Education music program at Grade 3 all have incorporated computer activities as part of the teaching outline.

While the hardware is still very sparsely distributed, a sufficiently high number of computers / school seems to have been reached so that the majority of teachers now can anticipate some access during the year. Such a minimal access level is necessary to motivate teachers to get involved. Nevertheless the low density cuts down the potential effectiveness of computer use and, more importantly, the initiative of teachers to work at building computer activities into their overall classroom process.

APPENDIX 2
STATUS OF COMPUTER USE IN PEEL SCHOOLS
1986

ELEMENTARY SCHOOL USE OF COMPUTERS IN PEEL

PART 1: Inventory of Resources and Types of Applications

In assembling the information for the Status Report, principals were requested to indicate the number of computers in their schools for instructional purposes, the location of that equipment and the types of uses to which the equipment was being put.

An attempt to provide a statement of the number of computers in elementary schools presents an interesting situation. In all calculations of the student/computer ratio for the purposes of regional budgets, only the number of computers supplied by Peel Board funds has been counted. In each year of the computer report, there has been acknowledgement of the fact that schools were also acquiring a significant amount of equipment from other funding sources. The extra computers became available through the special efforts of students, staff and parents, and because of the local initiative involved, the distribution of those additional computers and printers is very uneven through the schools. In order that this Status Report can reflect an accurate picture of the extent of use of computers in Peel elementary schools, all computers have been counted but their separate sources recognized.

INSTRUCTIONAL COMPUTERS IN ELEMENTARY SCHOOLS

Regional funds	Regular Classes	419
	Special Education	39
Non-Board funds		
	Fund raising	377
	Ministry of Citizenship	87
Total (all sources)		929

The 1983-1986 Computer Plan intended to reduce the ratio of students to computer to below 100:1 at the end of 1986 purchases. The data in the chart below show that the goal will be met and exceeded in most schools. The range of ratios results from the uneven distribution of students in schools. For a small school it is not possible to give less than one computer. In addition, some schools are well below the target ratio because these data include Special Education pilots which were assigned to about 30 schools above their ratio for school-wide applications.

PATTERNS OF STUDENT/COMPUTER RATIOS

	Percentage of Schools in Each Category			
	1985		1986	
	Regional *	All **	Regional	All ***
25:1 and under	-	4.1	0.8	8.1
50:1 and under	2.4	32.2	5.5	56.5
75:1 and under	11.1	36.4	64.3	29.8
100:1 and under	19.8	13.2	29.4	5.6
125:1 and under	23.0	8.3	-	-
150:1 and under	30.1	4.1	-	-
over 150:1	13.5	1.7	-	-

* From Regional funds only

** Including Non-Board purchases

*** These figures include 1986 regional purchases but not any which might come from non-Board funds in 1986.

Location of Equipment

Elementary schools have chosen a variety of different strategies to make the computers available to students and teachers. The strategy selected in each case reflects consideration of the physical layout of the school, the computer competence of the staff members and, most importantly, the types of curricular objectives the school has focused on for the use of the computers.

There are advantages to having all of the computers in a central location to which teachers can take or send their students. All of the equipment is permanently set up and the other resources such as software and printer paper can be kept in the same area.

Alternatively, if the computers in sets of one or two are permanently stationed in a classroom, the teacher and students can make frequent use of the equipment as a regular part of the classroom activities. Where there are not enough computers for each room to have permanent equipment, some schools rotate the equipment on a year's schedule so that one class will have exclusive use for several months at a time.

In the long run, schools will have a mixture of both the pod and the classroom strategy. A set of computers will be available, perhaps in or near the library, as a resource to the students and into which a teacher could take a class when it is appropriate to have the majority of the class doing something at once. In addition, students will have computers available in their own learning environment as a regular and familiar resource.

The pattern of distribution of computers in the Peel schools now is the result of each school deciding which of the two strategies to go with first.

**LOCATION OF
COMPUTERS BY PERCENTAGE OF SCHOOLS**

All in computer "room" or lab	12
Permanently in library	9
Pod plus some moveables	9
All computers moveable	5
Stationary in classrooms	27
Rotating on a schedule to rooms	33
Some in library/some moving	5

Applications to Curriculum

There are no courses for the study of computers per se in the elementary grades. Therefore all of the computer resources are available for cross-curriculum applications. Two resource documents, K-6 Computer Activities and 7/8 Computer Applications, provide teachers with a set of appropriate objectives and related learning materials for the integration of computers to various aspects of the curriculum.

It is difficult to identify, in any simple description, the various applications made of the computers in a school. However, principals indicated the types of applications in terms of the majority of time on computers. Any one school will have activities which fall into more than one category and it was not reasonable to obtain data on the percentage of time that any one computer is assigned to a particular objective. The accumulated information shows the predominance of creative, problem solving types of activities over the traditional drill and practice.

**TYPES OF
APPLICATIONS FOR COMPUTERS**

Language (creative writing, spelling)	91
Creative activities (art, music)	53
LOGO	39
Problem Solving	74
Math/drill and practice	72
Science/Geography/History	38
French	35
Special Education	48

Use of Equipment

Principals were asked to indicate the extent to which the computers were being used. A criticism occasionally heard is that there are computers sitting in schools not being used at all. This conjecture does not seem warranted based on the information provided by the principals. Certainly, it would not be expected that all computers could be used 100% of the time no matter how committed the staff nor how the computers are assigned. Nevertheless, the reported frequency of use suggests that computers are well integrated into the day-to-day processes in those places where they are available.

PERCENTAGE OF COMPUTERS BY DEGREE OF USE

Optimum use	30.9
Heavy but not maximum use	41.7
Regular intermittent use	23.3
Occasional use	3.3
Seldom used	0.8

Teacher Competence and Involvement

Teachers in the elementary panel have been very involved in computer in-service programs. Perhaps because the computers are viewed more as a school resource than the tool of one particular department, elementary teachers seem to feel that they can more immediately expect to have access to computers for their classroom. The figures here contrast to a significant degree from those reported for the secondary cross-curriculum areas.

TEACHERS BY CATEGORY OF COMPUTER INVOLVEMENT

	Percentage
Key computer-using teachers	18.2
Competent users	34.4
Occasional users	32.8
Not yet using computers	14.6

Sources of Support

Several differences are highlighted between the elementary and secondary panels in terms of the sources of support. The resourcing structure in the elementary panel is different in some ways from that at the secondary level. Field office resource teachers occasionally reach into the intermediate grades at the secondary level to assist teachers but the majority of their work is in the elementary panel. Similarly, the school administration in the elementary panel works more closely with the teachers at the day-to-day level and as a group they have undertaken to become computer literate enough to be a support to their teachers in the area of computers. Parents are much more likely to make themselves available as a resource to the staff at the elementary grades than at the senior division and that fact is reflected in the higher average ranking in the table below.

SOURCES OF SUPPORT FOR COMPUTER-USING TEACHERS

	Average Rating Scale 1 - 5
C.B.O. Resource staff	3.3
Teacher Computer Centre	3.1
Field Office resource teachers	2.4
Key teachers in own school	1.1
Teacher(s) from adjacent schools	3.9
School subscribed journals	3.2
School administration	3.2
Parent resource	3.9

The high level of competence and involvement of elementary teachers with computers in the

classroom, suggests a parallel high involvement in computer activities. In the following chart, the data show that teachers are making use of P.A Day activities related to computers and the Disk of the Month materials. Only about 2/3 of the principals even entered a response to the question about Users' Groups - they are small in number and usually meet the needs only of the most committed computer-using teachers.

The Computers and Educators courses have reached a very high percentage of the teaching staff considering that each contact represents a course of three or eight weeks. In many schools, the in-service was done on site perhaps by instructors supplied by the regional consultants or by in-school key teachers.

Principals were asked to indicate what percentage of the staff in their respective schools took advantage of the different Board sponsored computer activities. In the following table, the categories used by the principals are shown in the left column. The figures in the other columns represent the percentage of schools at which the staff fits a given category.

Percentage Used Activity	USE OF BOARD SPONSORED COMPUTER ACTIVITIES			
	P.A.Days	Disk of	Users'	C and E
		Month	Groups	Courses
Under 20	18.3	12.8	87.8	18.9
20-39	16.5	12.9	7.4	20.8
40-59	17.4	22.9	4.9	29.2
60-79	8.3	15.6	-	17.9
80-100	39.5	37.8	-	13.2

The staffs of individual schools have been very involved themselves in setting up and sponsoring computer related activities. It is obvious that the schools - parents, staff and students - have been doing fund raising for computers. 94.5% of the reporting schools indicated that they had been raising money for that purpose. The closer connection of parents to the school also resulted in an interest in sharing computer activities with the community. Parents' night programs for computers were run at 44.0% of the schools and 28.4% had conducted some sort of parents' computer course. Another 7.3% volunteered that they had run a Computer Fair of some kind.

PART 2: Computer Use from the Perspective of the Teacher

As with the secondary schools, two teachers from each school were asked to complete questionnaires designed to tap information about the way in which they used computers, the degree to which their workload was increased and the changes they noticed in their classrooms as a result of the presence of computers.

Accessibility of computers for class

Only a small percentage of schools have computers arranged in a lab or pod setting at the elementary level. Certainly most of those teachers who classified themselves as regular users are in a situation in which they have one or more computers right in their classrooms.

RESPONDENTS BY LOCATION OF COMPUTERS USED		
Configuration	Regular User	Occasional User
Lab	8.3	14.7
Library	6.5	5.9
Classroom	81.5	70.6
Mobile	3.7	2.9

The majority of teachers who answered the questionnaire had only one computer to use at a time with their class. This is a reflection of the number of computers in the average school and the method of hardware distribution chosen by the school.

RESPONDENTS BY THE NUMBER OF COMPUTERS USED		
Number	Regular	Occasional
1	59.2	62.3
2-3	18.5	14.9
4-6	22.3	20.8
More than 6	-	-

Most of the teachers who completed the questionnaires made more than 10 hours of use of a computer in one month - even those who are classified as occasional users.

PERCENTAGE OF RESPONDENTS BY AMOUNT OF USE		
Hours/month	Regular Users	Occasional Users
< 1	-	1.1
1-2	-	1.1
2-5	6.6	9.2
5-19	2.9	6.9
> 10	90.5	81.6

Role of the Teacher

Many comments were given in response to the question about any perception of changes in the role of the teacher when computers were being used in the classroom. The comments were grouped into categories and the raw number of citations for each comment indicated. Several teachers made more than one observation.

IMPACT ON THE ROLE OF THE TEACHER

	# of Observations
Little or no change	58
Used as a learning tool	53
Decreases teacher's time on drill	30
Workload increased ... but worth it	28
Organization essential	27
Become facilitator/student-centred	24
Teacher becomes learner tool	16
Students go to other room	9
Insight to learning difficulties	5

Classroom Atmosphere

Teachers in the elementary panel are accustomed to a variety of activities going on simultaneously in the room. Yet computers have a very compelling attraction for people - particularly children. It was of interest to know what impact, if any, their presence might have on the classroom atmosphere. The raw tabulation of comments made in various categories has been recorded.

EFFECT ON THE CLASSROOM ATMOSPHERE

Students motivated and excited	81
Positive atmosphere	56
Positive student interaction	42
Positive change in relationship between students and teacher	29
Negative comments(noise,distraction,etc.)	26
More intense, longer concentration	17
Very little change	16
Room alive, everyone involved	7

Differences Among Students

The wide range of roles that a computer can play in education suggests that there may be differences in the way some students react to some of those roles. If computers are to be an equitable resource to the Peel system, it is important to recognize any differences which exist and to ensure that more than one kind of experience is being offered so that all students can benefit from the computer potential.

DIFFERENCES NOTED BETWEEN STUDENTS

Boys and girls the same	80
Abilities of students relate to differences in the way they want to use computers	44
Boys like computers better	35
Boys like computer games	19
Students come early and stay late	16
Computer not a "judge" of student work	16
Girls like word processing	13
Girls seem to be intimidated by boys	9

The contrast in observations about the gender issue related to computers underscores the need to acknowledge the concern and make a commitment to develop strategies to provide equity of opportunity. However, the gender differences are not the only ones noted by the teachers and the patterns of use among learners of different levels of ability deserves attention as well. Teachers provided a list of strategies when asked to state what they had done to overcome the differences they had noted between users (if they had noticed any).

**ATTEMPTS TO
OVERCOME DIFFERENCES**

Group students (girl and boy or skilled and unskilled)	35
Equal time schedule	33
Encouragement to all	30
Software selected for individual's needs	29
Encouragement for girls	18
Computer club (girls as members or girls only)	10

Overall, the information provided by the data in the inventories and questionnaires support the observation that the computers which have been placed in Peel's elementary schools is being used extensively with students and that the number of teachers involved is increasing. The need for more teacher training and teacher support directed at the classroom level is identified in different ways by several of the separate tables.

SECONDARY SCHOOL

CROSS-CURRICULUM COMPUTER USE

PART 1: Inventory of Resources and School-wide Use

When the Computer Report came into effect, there were very few situations in Peel secondary schools in which microcomputers were being used in other than Computer Studies classrooms. Until that point, regional and school funds had been used to introduce microcomputers as alternatives to the Wang minicomputers which had been the basis of Computer Studies resources from 1972. The Computer Report met Computer Studies requirements by focussing the distribution of hardware funds in that area.

It was intended that as the pressing need for those resources was met, the proportion of the budget allotted to cross-curriculum applications would increase in comparison to that for Computer Studies. In addition to the intention to first meet the Computer Studies commitment, the more gradual build up of cross-curriculum equipment resources was justified by the near total lack of teacher preparation and readiness and the paucity of software relevant to Ontario senior curricula. Because of the small amount of money available and the limited number of teachers interested and prepared for computer use in their classrooms, the early strategy for the distribution of the funds hinged on the identification of pilot projects - in as wide a range of subject areas and schools as possible given the proposals submitted by schools.

The second year of the report found that most of the first pilots had identified very positive applications and many more teachers now wanted to become involved. Once again, the money was assigned, on the basis of proposals submitted, to evaluate new applications and to extend computer availability for applications which had proven so effective in the first round. It was guaranteed that all schools would have at least one pilot site so that the spread of cross-curriculum commitments would be as equitable as possible from central resources.

The third year of the Report, designed to focus on the cross-curriculum component of the secondary panel, will see a relatively even distribution of the budget monies among the schools. Equipment purchases are being made to address the curriculum aspects given highest priority by the staff and administration of the school. Within the schools, some allocations are being made from capital(new) budgets to augment the equipment coming from regional purchases.

Equipment Availability and Location

Several factors complicate any description of the number and distribution of hardware resources for cross-curriculum use.

- In some schools, the computers placed in a lab setting primarily for the purposes of Computer Studies courses are available during some periods of the day, for other classes.
- Where computers have been purchased to replace typewriters for Business Education courses, the equipment is cross-curricular in nature but really only used by one particular course. The large numbers of these machines can significantly distort the student to computer ratio in a school.
- Most schools have already or are in the process of setting up a cross-curriculum computer room to which teachers from many subjects can take classes for particular computer activities. Many departments may make some use of this facility but not be as involved as their colleagues who have computer resources right in their own classroom.
- In some cases, computers are shared by two or three departments.

The number of computers for cross-curriculum use is hard to calculate since the inventory is flexible with computers often shared among more than one or two departments. The following summary represent averages only and should not be interpreted as indicating any equity of accessibility.

Computers for cross-curriculum use	420
Average/school	17.0
Students/computer (average)	70.3

The inventory of equipment and areas of use summarized above does not include computers placed in Counselling Departments for the purposes of providing the CHOICES package. All secondary schools in Peel now have at least one computer to offer that facility - hardware and software provided from regional funding.

Use of Equipment

It is not reasonable to expect computer equipment to be used a full 100% of the time in any situation. Even in a Computer Studies classroom, students are frequently assembled for at least part of a period for instruction in the concepts which they will later work with on the computers or for testing time. Nevertheless, with the size of the investment being made for equipment, there has to be some expectation that there will be frequent and regular use of the hardware resources.

Schools varied widely in terms of the degree to which the cross-curriculum computers have been in use. ["Indicate the percentage of your hardware which falls in each of the categories of use."] These data represent the average reported time of use by school, not the use by amount of equipment since some schools have more resources than others.

PERCENTAGE OF COMPUTERS BY DEGREE OF USE

	Average (all schools)
Optimum use	36.9
Heavy but not maximum use	38.7
Regular but intermittent use	21.9
Occasional use	2.3
Seldom used	0.2

The fact that over 75% of the schools reported heavy or optimum use attests to the commitment Peel teachers have for the use of computers. In schools where the use was reported as "regular but intermittent", the lower intensity probably reflects a growth period as teachers become familiar with the software and develop strategies for its inclusion in the curriculum.

Teacher Competence

Although the availability of hardware is the critical factor in introducing computer use across the curriculum, it is the readiness and willingness of the teachers which governs the degree of integration and the effectiveness of any application. Principals were asked to assess, for their whole staff, the degree of teacher comfort and competence in using computers with students.

TEACHERS BY CATEGORIES OF COMPUTER INVOLVEMENT

	Average	Range
Key computer-using teachers	14.8	5 - 33
Competent users	19.5	10 - 35
Occasional users	20.4	5 - 37
Not yet using computers	45.3	15 - 72

Unlike many of the elementary teachers who have taken computer education courses with the expectation of some day soon having access to computers for their students, secondary school teachers have tended to become involved intensively only when the hardware is available or its arrival is imminent.

Sources of Support

A support structure for computer use is difficult to build and maintain in a system the size of Peel. This is particularly true with cross-curriculum applications where there is no guideline to outline appropriate computer uses and where there are so many types of applications each requiring different software and therefore specific teacher training opportunities. At the secondary school level there is very little contact with the field office resource staff which has been used to support computer use in the elementary panel.

Now that the emphasis has swung so strongly towards the widespread use of computers in so many secondary classrooms, there is a need to expand and improve on the current resource routes. Principals were asked to indicate which sources of help with computers teachers might currently be using. ["Indicate which sources of support your teachers would be likely to access."]

SOURCES OF SUPPORT FOR COMPUTER-USING TEACHERS

	Average Rating 1-5 Scale	Number of #1 Ranking
C.B.O. Resource staff	2.9	3
Teacher Computer Centre	3.0	1
Field Office Resource teachers	3.7	0
Key teachers in own school	1.0	23
Teacher(s) from adjacent schools	3.5	2
School subscribed journals	3.2	1
School administration	3.6	0
Parent resource	4.8	0

A category of "Other" was used by six schools - four to indicate the role of students as resources and the others to refer to the Board service contract companies. The high rating given to key teachers in the school as a source of support raises the issue: from whom do the key teachers get their support?

A variety of separate activities are in place in the Board to assist the teachers who are using computers with students. According to the principals' responses, schools vary widely in terms of the use they make of these activities. ["In your estimation what percentage of your staff has used the following support features?"]

USE OF BOARD SPONSORED SUPPORT ACTIVITIES

	Average	Range
P.A. Day computer workshops	39.6	10 - 80
Disk of the Month	19.9	5 - 60
Local computer users' groups	7.9	0 - 40
Computers and Educators' courses	26.6	5 - 70

At the secondary school level, there has not been very much done in terms of school-wide or community involvement activities related to computer use in classrooms.

ADDITIONAL COMPUTER RELATED ACTIVITIES

	# of Schools
Parents' Night computer theme	6
Fund-raising for computer equipment	3
Computer course for parents	4
In-school workshops for teachers	3
Parent computer newsletter	2
In-school contests	2

School Computer Committee

The breadth of the involvement of computers across the curriculum and the need to coordinate the acquisition and management of resources to optimize their use makes it important for a school to have a cross-curriculum computer committee. In the various schools, those committees have different compositions and mandates. Only one school of the 24 reporting indicated that there was no computer committee.

COMPOSITION AND MANDATE OF COMPUTER COMMITTEES

Composition	
One representative/department plus administrative rep.	5
One representative/department	6
Six selected representatives plus administrative rep.	1
Six staff members	6
Three staff members	1
All staff (Indec)	1
No composition specified	1
No committee	1
Mandate of Committee	
Acquisition and placement of hardware	7
Recommends software	6
Room scheduling	3
Advisory Committee to administration	3
Professional development	2
Lab configuration and rules	1
Everything	4
Not clear or no report	2

PART 2: Computer Use From the Perspective of the Teacher

Two teachers from each school were asked to complete a questionnaire indicating the extent of their use of computers with their students, the impact on their own workload and the sources and level of their training. It was requested that each school include one regular user and one occasional user. However, the interpretation of those terms varied among schools and so for some of the results reported here, the information was combined for the two groups.

Accessibility of computers for class

The availability of computers for use by teachers with students varies among schools. In some situations a set of computers is in a computer resource room or pod (in the library) to which teachers send or take groups of students. In other situations, a few computers are available for teachers to move into their room as they want to use it. Some classrooms have permanent computer placements so that students can have access to them frequently and as on-going resources in their work for that subject.

PERCENTAGE OF TEACHERS BY CONFIGURATION USED

Configuration	Regular	Occasional
"Lab"	57	78
1	19	11
2-3	12	6
4-6	12	6

Since occasional users employed computers either in a computer lab or with one brought to the classroom, they would have to do more organizational work to move either their class or a computer. As a result they are only going to go to that trouble for just one or two programs which have particular relevance for an aspect of their course. The reasons for the occasional use may include availability of good relevant software and the competition for the hardware as well as the organization time involved.

Regular users have either got more immediate access to hardware in their classroom or they have integrated computer support into their program sufficiently that a regular trip to the computer room or visit of a computer trolley are all part of the on-going classroom process. Many of these regular users reported hours/month as high as 100 - probably those who have a computer at the back of the room.

PERCENTAGE OF RESPONDENTS BY AMOUNT OF USE		
Hours/month	Regular Users	Occasional Users
< 1	0	25
1-2	0	19
2-5	17	38
5-10	25	6
> 10	58	12

Teacher Workload

It is anticipated that the introduction of computers to the classroom will require a commitment of time and involvement by computer-using teachers. In the initial stages their commitment was in response to their own particular interest in computers and extended far beyond what was actually necessary. Now that computer use with students has extended to include less committed teachers, the emerging pattern will provide a more realistic indication of the increase in workload.

It is further expected, however, that much of the extra time put in during the first year will not need to be repeated since curriculum materials, once prepared, can be reused and teacher comfort with specific software will not have to be developed a second time. There was no consistency or pattern to the amount of time teachers indicated they spent preparing to use computers in the classroom in addition to the regular workload. This area of teacher workload is one that requires a lot of attention and more specific information needs to be gathered before any summary comments can be made.

Role of the Teacher

Almost all of the teachers surveyed responded to the question about the change in their role caused by computers in the classroom. [How has your role in the classroom been affected by computer use?] The most frequent comment indicated a change in the role from instructor to that of facilitator, consultant or resource person. A similarly frequent remark suggested that there was more student-centred learning particularly with small group work and individualized work. Students were seen to be stimulated to work in groups and to be better risk-takers.

Several teachers acknowledged that they had to be better prepared in terms of class management with a need for clear initial instructions and to be flexible in the flow of the classroom activities. But, they recognized that they had more opportunities to have personal interaction with students and in many cases they felt that they became a learner too and developed a good rapport with students.

Classroom Atmosphere

The majority reported that there was a positive change in the atmosphere in the classroom - in most cases citing a closer or improved relationship between students and teacher. Some said that there was a student-centred classroom rather than teacher centred classroom with the computer present. Evidence of the motivational strengths of computers was noted by many teachers, some describing the room as becoming alive with everyone involved.

Where only one or two computers were available and the computers were new to the classroom, some teachers found that the computers could become a distraction to the rest of the class since many were wanting to share with the students on the computers. Other examples of that increase in student to student communication was noted by a significant number of teachers who saw advantages to the sharing of knowledge and a willingness to work in groups. One teacher expressed the same idea by indicating that with computers, there is no passive learning, everyone becomes involved. Only one teacher admitted that the classroom activity seemed more fragmented and hectic.

Differences Among Students

Many teachers reported differences among students in the way they worked with computers. [Have you been conscious of differences (eg. learning style, gender) between students in the way they like to use computers - both their level of interest and the things they like doing most.] There seems to be a significant difference in comfort and interest according to the previous experience that students had with computers. Many students were apprehensive or negative at first but for most that was a passing phase.

However, other differences of a more long term nature were also identified. Some students appeared to work better in a creative mode and others in a more structured situation. Some teachers drew links to differences in the characteristics of the types of learners or to differences in gender. However, the connections drawn often were in opposition to views expressed by other teachers. Certainly differences in the types of activities that the teachers set and the way in which they organize

and prepare the class will contribute to a range of responses as well. This area of different responses by different learners and what motivates the difference types of students requires considerable further investigation and analysis.

COMPUTER STUDIES - SECONDARY SCHOOL

Computer Studies courses in secondary schools are described in the Ministry guideline "Computer Studies : Intermediate Senior - 1983". All courses authorized by the guideline are offered in most Peel schools, though not always at all levels of difficulty.

All schools offer the Grade 10 Introductory Computer Studies course. This course allows students to receive an overview of the various uses of computers, including introductions to concepts and activities such as word processing, programming, data processing, computer technology and the societal impact of technology. For students selecting Basic level courses, a single credit at the Grade 10 level may be offered and additional partial credits as components within other courses (for example, a word processing unit within an English program).

Students in Grade 11 may choose from one of three "paths" in terms of increasing computer-related expertise. These "paths" comprise Data Processing (Business Education), Computer Science (Mathematics) and Computer Technology (Technology). Some students may choose courses from more than one path.

It should additionally be noted that numerous other courses offered by Business Education departments under other guidelines make use of the same equipment used by Data Processing/Computer Science classes in schools where timetabling allows.

The following are enrolment figures for September 1986. (Totals do not include vocational schools or either Indec, although a variety of Computer Studies courses are offered in those settings).

1986-1987 COMPUTER STUDIES ENROLMENT					
COURSE	MALE #	MALE %	FEMALE #	FEMALE %	TOTAL
DIC2A0	1174	58	863	42	2037
DIC2G0	641	53	568	47	1210
DST3A0	626	75	212	25	838
DSC4A0	385	79	100	21	485
BPT3A0	374	61	242	39	616
BPC3G0	310	49	318	51	628
BPS4A0	234	73	85	27	319
BPS4G0	174	50	172	50	346
TOTALS	3918	60	2561	40	6479

Note: Enrolment statistics for Computer Technology courses are not included. For the most part, equipment used in these courses does not fit the pattern of labs of microcomputers. While using some micros, the courses make use of logic trainers and other specialized equipment. Computer use in Technology courses in general is reflected in the cross- curriculum section of this report.

Equipment used in Computer Studies courses varies greatly from school to school, and in some cases within individual schools. Generally speaking however, schools can be categorized as having one or more of three types of facilities:

- Type A - Consists of an "intelligent" networked lab, with all stations having access to mass

storage and printer, and additionally each individual station having "intelligence". This system combines a high level operating system (usually UNIX-like) and access to many languages such as Waterloo Basic, C, Pascal. At the present time, examples of such systems in Peel consist of Burroughs ICON and IBM EDNET systems.

- Type B - Consists of multiple (typically 6-8) stations linked through a "non-intelligent" network system to share access to a common disk drive or printer. Advantages of such a system are primarily economic - fewer disk drives and fewer copies of individual pieces of software are required. Additionally, there are benefits to exposing students to an approximation of a shared or networked system. Disadvantages include slowness of loading software to all stations, the fact that some useful software will not run on this type of system, and the general tendency of the networks to be balky and to "go down". In Peel, examples of this type of system would include Microshare, Arbiter and Mupet systems. (The first appears most effective, the Mupet least). Such systems can be linked to a variety of hardware.
- Type C - Consists of a lab of individual stations, each linked to its own disk drive. Usually 2-4 printers are available, linked to specific stations. (When students wish to print something, they either move to those stations, or move the printer to their own station). While such a lab overcomes the difficulties expressed in Type B, it can be extremely expensive to provide suitable software for every station, and time-consuming to move from station to station to load. More importantly, some of the important concepts and activities considered in both Data Processing and Computer Science courses are less effectively or easily taught on non-networked systems, or systems without access to additional languages. In Peel, such labs typically consist of PET 8032 or upgraded PET 4032 machines, or to a lesser extent, Apple IIe or TRS 80 computers.

The Type C category can be further subdivided into "old generation" or "new generation" equipment. Old generation equipment would generally be more than two years old and no longer available. This equipment would usually have a monochrome screen and 32k or less memory capacity. Languages other than Basic would not usually or easily run on this equipment. New generation equipment would have the capacity to work with a colour monitor, have a larger memory (64-128K) and run, to some degree, forms of languages such as "C" or "Pascal". More importantly, this equipment allows easy access to a wide variety of educational software useful in the Grade 10 courses in particular.

Generally speaking, it would be advisable for students in all Grade 11 and 12 Computer Studies courses to have access to a Type A environment. Grade 10 Introductory Computer Studies would also benefit from such an environment, but should at the least have access to hardware which permits the use of a variety of software including word processing, spreadsheet, database, Basic, graphic, music, simulation and other software tools.

The following summary represents the information returned on the school inventories of Computer Studies courses. The data are from April 1986 and do not include the 1986 budget purchases. Where the anticipated acquisitions will significantly change the pattern, the new data are shown in square brackets.

CLASSIFICATION OF COMPUTER STUDIES FACILITIES

Up to June 1985

Type of system	# of Schools with 1 or more labs		Total number of labs
TYPE A	8 [13]	10 [15]	- 9 [10] ICON - 1 [5] EDNET
TYPE B	14	25	- 9 Microshare - 8 Arbiter - 4 Mupet - 1 ECONET (Acorn) - 1 Net II (TRS80) - 1 Net III " - 1 IBM/Terminals
TYPE C	14	23	- 10 PET ("old") - 8 C64 ("new") - 3 Apple IIe ("new") - 2 TRS80 ("old")

BRAND NAMES OF HARDWARE IN LABS	
Commodore PET (8032,4032,SP9000)	452
Commodore C64/C128	120
ICON	164
EDNET	33
IBM Terminals	8
Apple IIe	28
TRS80 (II,III,IV)	56
Acorn	14

Note: This chart does not include hardware used in non-Computer Studies courses. Specifically it does not include PC10 labs used for Keyboarding courses. However, in a few cases, other courses make use of such equipment when it is available in the timetable.

APPENDIX 3
CURRICULUM EXPECTATIONS

CURRICULUM EXPECTATIONS

Computers K - 6¹ Aims and Objectives

Aims

Learning experiences shall be based upon sound principles of child development and learning.

Learning experiences shall be integrated into the curriculum.

Learning experiences shall encourage the development of a realistic attitude towards computer technology.

Learning experiences shall develop and maintain confidence and a sense of self-worth.

Objectives K - 6

1. Every opportunity should be taken to explore computer applications in home, recreation, school, government, business and service industries as part of an on-going integrated theme.
2. Students should be given the opportunity to read, discuss, and report about the affects of technological change, and the positive and negative implications of computer use and misuse, to develop an appreciation of the ethics of our society.
3. Children should use software which presents opportunities to develop and practice problem-solving strategies, and be encouraged to select appropriate software to assist them in their own problem solving.
4. Children should be given the opportunity to develop an awareness of the sound capability of computers.
5. Children should be given the opportunity to develop an awareness of the graphic capability of computers.
6. Students will use a variety of programs to develop Language Arts Core objectives for speaking, reading, writing and listening.
7. Students should be taught how to use a word processor to facilitate the writing objectives of the Language Arts Core.
8. Children should be instructed in the care and proper maintenance of the equipment to meet the aims of safety and preventative maintenance.
9. Students will learn computer terminology as required.
10. Students will be taught to use the keyboard efficiently, including graphic keys, alpha-numerics, and function keys as necessary to meet their needs.

¹K - 6 Computer Activities Draft Version Peel Board of Education

11. Students will learn to use Logo or similar software to develop problem-solving strategies.
12. Students will have the opportunity to store and retrieve information from a data base.

An Approach For Computer Use K - 6

COMPUTERS IN K - 6 reflects a belief that it is important for our children to work with, enjoy, and learn about computers and our increasingly computerized society. It reflects, too, a belief that computers can be a valuable aid in the learning process, and aid which:

- enables the individualization of instruction
- encourages the development of literacy skill
- enhances the curriculum
- encourages discussion and debate
- promotes the sharing of ideas and experiences
- fosters the excitement of learning
- offers new challenges for our children
- provides a tool for more productive learning

The computer should not be:

- an object of awe, or direct study
- used to produce computer programmers
- used for the playing of "games" which have no redeeming educational value, or promote violence or intolerance

This document does not intend to suggest that the computer is necessarily a better way of producing art or music, but that it is a different medium, to which our children should have access. Similarly, while the computer can be a useful tool to simulate learning experiences or situations which would otherwise be difficult or impossible to provide to children, it should not be used indiscriminately. As an example, computer images should not replace concrete objects used to develop manipulation skills or mathematical concepts - but such images might provide appropriate reinforcement or extension activities.

It should be understood that not all objectives are appropriate for all grades or even all students in a particular grade. Computer learning experiences should meet the needs of the individual student with consideration for prior knowledge, skills, aptitudes and interests.

It should also be recognized that the ability of individual teachers to effectively integrate the computer into their day-to-day programme will develop at different rates, according to personal experience and interest and on-going access to a computer and software appropriate to student and program requirements.

It is recognized that this document represents only the first phase of Computer Education in the elementary grades. Teachers who have worked extensively with computers already feel that these activities need to be expanded and extended, and so they should - but the document is intended to give all teachers of these grades an opportunity to begin to implement computer understandings in their classes.

At these introductory stages of computer use in the elementary schools, the focus is on computer activities which make use of the computer as a tool of the student's other activities. Students will have creative experience in writing, art, music and other areas while they work with the activities outlined in this document. Such a focus has been chosen because of the small numbers of computers available, the minimum level of teacher experience with computers and the availability of software. An incredible number of worthwhile experiences can be provided to students with only one or two pieces of software and with only a small amount of computer preparation and supervision by the teacher.

Another dimension of the use of computers in the K - 6 classroom is through the use of 'stand-alone' software. In this case, the educational program is complete in itself in the sense that once into the program, the student will be led logically through a series of pre-determined activities. Drill and practice, simulations and tutorial packages fall into this category. Many of these have particular value for students at primary grade levels or in Special Education settings and such applications are supported.

The Disks-of-the-month have brought to each school programs which may be used with primary and junior students at the teacher's discretion. The list of software in the Board bulk purchase also includes commercial materials which have application at the primary/junior level. When teachers undertake to use 'stand-alone' programs with students they should:

- preview the software completely and carefully themselves - to the end.
- set learning objectives for the use of the material by students and ensure that those objectives balance with other classroom activities
- create the appropriate environment for the use of the software including:
 - student schedule
 - number in student groups
 - timelines for project
 - leadup activities
 - followup or debriefing
 - evaluation of program use and student achievement and satisfaction

Outline for the Computer Applications Program² for Grades 7 and 8 in Peel

While the Ministry of Education Computer Studies Guideline sets out an extensive and balanced package of courses for secondary Computer Studies, and computer use in all subject areas is urged at

²Grades 7 & 8 Computer Applications Resource Document Peel Board of Education

the secondary level, no such directives have yet been issued specifically for elementary grades. However, memoranda and the Minister's speeches continually emphasize the importance of computer access in the early grades and Ministry sponsored software development give equal support to elementary programs. Rather than allow random development of computer initiatives within the schools, a school board must work toward a pattern of appropriate applications and equal opportunities for use. Based on that premise, the materials in this package are intended to provide structure to the computer activities of the grade 7 and 8 students in Peel schools. This particular document is the revised edition of the draft Computer Activities 7/8 distributed for testing in the fall of 1984.

It is important to ensure that these introductory computer activities address the needs of and are at a level appropriate to the beginner in order to bring some measure of equality of opportunity to all students in these grades.

Because of the rapid increase in the number of home computers and the increasing probability that students will have used computers in some way in their earlier grades, this emphasis on the first time user will change over time. However, equality of opportunity must continue to be the major goal for computer use at the 7/8 level and these activities have been designed to that end. Even in schools where computers have been used for several years, the lack of equipment and the inconsistency of teacher training and involvement, frequently has resulted in only a portion of the students having had some significant exposure. Inevitably each class will have some students who have had considerable access to computers and who may have developed skills beyond the level aimed at here. However, such advanced work is usually narrow in its nature and the breadth of the activities in this document will provide new dimensions for all but a very few students.

Because of the dramatic increase in computer use in K - 6 grades, the activities outlined in this package are anticipated to need expansion within two years. Nevertheless, such changes will not place more emphasis on the study of computers per se unless Ministry directives focus such objectives in the elementary panel.

The approach taken in Peel is to learn about computers by using them in a number of different ways.

Computers are first and foremost tools which can be used with many different tasks. Since all students will use computers in some way in their lives both at home and at work, the computer as a tool is the most effective approach for an introduction. Learning about computers is also a goal of this set of activities but the development of such skills and understandings comes through using computers effectively for other curricular objectives. Sufficient time remains in the secondary panel for an intensive study of computers themselves: programming, hardware and major software packages.

The material in this document must be viewed as a two year package.

Because of the time demands of the existing curriculum in grades 7 and 8, the expectations for introductory computer contact time have been spread over two years. If more time is available for computer access in a particular school, more opportunities to use computers in the ways introduced through these activities would be appropriate. For example, once a student can make use of the word processing capabilities of the computer, a whole range of tasks for any subject area can reinforce the student's skills with this most important computer application while at the same time enhancing the specific subject objectives.

These materials are designed to be split up among several teachers of a grade so that computers are applied to those curriculum objectives where they are most appropriate

and can be most effective. In some instances where general staff training has not progressed sufficiently far enough, the activities could be dealt with, as an interim measure, by one teacher in a specific computer room setting.

While the latter of these two modes is often easier to set up in the short term, it can block the full and balanced integration of computers into a 7/8 program. Where teachers share the responsibility for providing computer experiences, they find very appropriate and useful ways to use computer skills that relate directly to the curriculum. When one teacher works through the computer activities in isolation from the rest of the student's learning program, the computers tend to become the focus of the study. We intend instead that there be a concentration on the introduction of the necessary skills and understandings when and as they are needed to perform other tasks.

As established in the Computer Plan 1984, computer exposure for students of grade 7 and 8 should be about 25 hours each year. Much of that time will be spent in small groups working together at a task on the computer. In addition, some time may be used in related research, in preparing for effective use of computer time or in debriefing from shared computer experiences. Because of the computer/student ratio and the difficulty of computer management, individual student work at a computer will likely form the smallest portion of the total computer time.

The computer hardware and software resources are limited but careful planning and management will maximize student/computer contact.

Board funds originally provided a ratio of one computer/100 students in a school for the delivery of this material. In many instances, previous purchases, parent or school funds had improved that ratio and additional computer placements from central board funds have continued to augment the resource base. Several approaches to the management of equipment are outlined in the section How To Use These Materials.

Much of the public domain and licensed software to be used with these materials is already in the schools through the Disc of the Month program or will be distributed in the near future. Commercial software packages have also been provided from central funds. Some such as TYPING TUTOR and LETTERPRO have been provided to all schools, while others will be placed in the Teacher Centres at each Field Office.

Grades 7 & 8 Computer Applications Objectives

Pre-Literacy Activities

Through the supervised use of computers in a variety of ways, students will have the opportunity to:

1. understand basic computer vocabulary and the function of the various components of a computer;
2. be aware of and practise appropriate procedures for the care and safe use of computer equipment;
3. be able to turn on the equipment and load and run software from a disk;
4. become familiar with the computer keyboard and the function of special keys.

Computer Activities

The computer application objectives are the same for both grades - 7 and 8. The differences lie in the specific activities used to address the objectives and the level of competence and sophistication expected from the students. Schools may wish to highlight particular objectives in a certain grade; but, each objective is appropriate for and should be addressed in both grades.

Through the use of computers in various subject areas, students will have the opportunity to:

1. understand how data are stored in a computer and used in a data base and make use of a data base in Social Studies and Science;
2. use a computer as an art medium and use a graphics tablet to accomplish a task resulted to their art activities;
3. explore the advantages of word processing in producing and editing text and use their word processing skills in writing related to curriculum topic;
4. translate spatial tasks into code for computer processing (LOGO);
5. become sufficiently adept with LOGO commands to use LOGO to problem-solve (LOGO);
6. use a computer in the direct mode to carry out alphanumeric manipulation for tasks related to the Grade 7 and 8 math curriculum;
7. experiment with the sound capabilities of a microcomputer, including composing, editing and replaying original music;
8. understand what a computer simulation is by working co-operatively on an example;
9. become familiar with a range of uses of computers when they become appropriate in many curricular situations;
10. in situations where group work is appropriate, use a computer cooperatively;

11. through repeated use of computers, improve personal keyboard skills.

"Hands - Off" Activities

NOTE: These computer-related activities do not necessarily require access to a computer. However, they might be combined with a unit which does require computer use. These activities should be integrated into the curriculum where appropriate, in either grade.

Through incorporating these Hands - Off computer topics in other curricular projects, students will have the opportunity to:

1. write about computer-related topics in a variety of modes;
2. read computer-related literature
3. investigate various applications of computers;
4. become aware of the impact of computers on our society;
5. become aware of common ethical and moral issues relating to computer use.

APPENDIX 4
STRATEGIES FOR IMPLEMENTATION

STRATEGIES FOR IMPLEMENTATION

A. Networking Computers for Instructional Use

The next phase of computer placement and acquisition in Peel is based on a long term vision of a networked school with computers available for curricular support in most classrooms and in central study or library locations. GEMs equipment makes it possible to have students work on an assignment on a station in the classroom and then move to the library to do related research. Through the network, the students can access their own working files from either location or from another classroom later in the day.

Networking computers in a classroom or between rooms in a school offers several advantages to the students which stand-alone computers do not.

- Students have continuous access to their own work and to a wide range of software from any point on the network.
- Sharing a large storage space permits students to save their work over time so that they can trace their own development, e.g. student writing folders, and cross reference their work in different subjects.
- Networking allows co-operative or collaborative activities as students share parts of tasks or edit each others work.
- Software, funded by the Ministry, is being designed to take advantage of the large storage capacity and the extra power which is available when the resources of a network are shared among a number of student stations.
- In the world beyond the school system, networking and communications are the focus of the way in which computers are settling into the business world.
- The image of a student working in an isolated environment in front of a computer screen with no human contact has firmly been rejected by educators in Ontario where the focus is on increased sharing and student interactions both in front of and by way of computers.

As GEMs are introduced to new schools or expanded at existing sites, cables must be installed to link the user stations to each other and to the file server. Within reason, the initial cabling should anticipate the locations where the computers might be placed for student access. Computers can be moved from place to place (not on a daily or weekly basis) to accommodate shifts in student use if the appropriate cabling has been done.

In the resource-based approach to learning, the school library plays a major role in co-ordinating the use of materials. A networked computer system is perfectly designed for a school-wide exchange and sharing of information and that network should be linked from the beginning into the library. The librarians will need to be trained to manage software on the network and to understand the types of

learning objectives the classroom teachers are addressing via the computer system. Students in the library to do research can also link back to the classroom to ask teachers questions or can enter their own file space and access work done in the classroom.

The concept of a networked school within which resources are shared and students can access their own work from any location can be extended to the scale of a school board. Already, initial steps have been taken to enable librarians to exchange information among the schools via a computer bulletin board. A future model of communications within the Peel Board should include a network system which allows teachers, resource staff and classrooms access to each other through telephone lines and computer equipment. The planning of cabling systems to meet current network needs within a school should be in the context of a broader communication design with links to external resources.

B. A Sequencing Model of Hardware Placement

In the elementary panel, computer distribution through the system has been even and predicated on the assumption that The first step in introducing computers to the elementary panel was to encourage and support lead computer-using teachers and to provide computer access to some extent to all students equally. The second Peel computer plan should introduce equipment on the basis of a sequenced model. Computers set up in a network should not be introduced in pods of fewer than five work stations. The cost of training site administrators and the front- end cost of the managing fileserver preclude any installations smaller than that but the cost effectiveness of the installation increases with higher numbers of units.

In addition, the focus on one particular division and on a set of accumulating software will facilitate the development of curriculum resource materials for integration of computer activities. Also, teacher in-service and an in-school 'coaching' model of support will be more effectively established.

In the secondary panel, the subject based structure of the schools has shown clearly differences among the subject disciplines in terms of the readiness to make effective use of computers in the program. Several factors affect this readiness:

- the amount and quality of currently available software;
- the relative ease with which the applications can be blended with current classroom methodologies;
- the similarity between the learning engendered by the computer activities with the theory base of the subject;
- the degree of support in the Ministry Guideline and the Peel curriculum documents for computer use;
- the cost or availability of specialized hardware peripherals;
- the readiness of the teachers of that subject as represented by the number of involved teachers, the commitment of the Heads' Association, the support of provincial subject

associations and other professional groups and the amount of time required for the prerequisite level of in-service.

Where programs are already underway in other subjects in a school, support should continue to be provided in terms of software acquisition and teacher workshops. If particular applications require alternative equipment and the type of equipment has been approved by subject co-ordinators and representatives of the appropriate Heads' Association, regional funds could be used to expand those initiatives for which curriculum support materials are available and appropriate in-service activities are possible.

In the last year of the 1984-86 Computer Plan, the hardware for Special Education was assigned to schools according to a pattern based on the greatest potential for impact on the students. The first priority was to place computers in senior and intermediate Specific Learning Disability classrooms. The focus on one curriculum area made it possible to prepare classroom resource materials and to in-service the teachers involved in very directed ways. The efficiency of this strategy suggests that it should be continued in the next Plan.

For ESL/D computers, the allocation has also been a regionally planned one which in the first instance focused on a geographical distribution within contained classrooms. The same process of a planned integration should be continued for ESL/D also.

Libraries, in all Peel schools, centre the resource inventory. As the networking of computers is done throughout the system, libraries should be included on the school network system, as it is established, to support the Board philosophy of shared resources outlined in "Partners in Action". The sequencing strategy will allow librarians to focus their efforts to provide support for computer activities on the grades or subjects involved.

C. Location of Computer Equipment

The last three years has shown that computers are used more effectively to meet curriculum objectives if the computer is right in the classroom area. Students develop confidence with the equipment from frequent access and proximity. They learn to value what the computer can do and to evaluate it against alternative equipment for different situations. The computer can take its place as one of several media or tools in the learning environment and teachers can work computer opportunities into the flow of other instructional activities. While the ideal is probably three computers/room and a reasonable goal for Peel in 1993 would be two to a room and a small pod in the library, the distributed model is the best strategy to achieve curriculum integration.

D. A Model for In-service

The recommended model evolves from the unique pattern of program support in Peel where the classroom is acknowledged as the place where attention should be focussed. To provide classroom teachers with daily support and to focus frequent training sessions in the school setting, a 'peer-coaching model' should be used for computer integration.

One teacher, with a strength in curriculum and adult education training as well as competence with computers, will be identified in each school. This 'coach' will be given a significant initial chunk of training in the required computer skills and the related curriculum materials. Throughout the year, these coaches would receive frequent up-dates and new materials. Classroom teachers will be given shorter initial training and then worked with inside the school by the coach. In the elementary panel a further level of support is offered by field office resource teachers whereas the secondary teachers will need the additional, specialized support of a small number of subject peer-coaches.

Field office resource teachers will be prepared for their roles in supporting the use of computers in curriculum by central staff and some of them will participate in the local training of teachers at workshops in field office locations. The training materials will be prepared jointly by the computer education staff and the subject co-ordinators and consultants and both groups will be involved in training coaches and field office staff. The curriculum links are key and the coordination of computer education and other curriculum specialists is essential. The training model carries on in each school in a less concentrated form for two years after the year of installation including central funding for coach release time.

In-service for computer use at the secondary school level must be directed at curriculum implementation. Teachers will develop computer competency skills as they require them to make use of a computer in some way for their students. Initially, coach/teachers should be trained by regional staff from both the computer education staff and the subject co-ordinator. The other classroom teachers involved would then, in turn, be given training by the coach/teachers of their subject area. Since follow up support is necessary if in-service programs are to be used effectively in the classroom, the coaches will continue to be available to small workshops or individual up-grading throughout a three year period although most of the time required would be assigned to the first year.

This subject-centred coach model would provide the much needed direct curriculum link. Each school, in addition, should set up an in-school coaching system to provide support for the general classroom methodologies and the networked concepts which are internal to each school environment. The school librarian should be linked to both layers of in-service -- the curriculum specific and the in-school strategies.

For Special Education and ESL, in-service programs should be continued for those teachers who are to receive access to a computer as part of the integration plan and that the in-service be built around classroom activities prepared specifically for special student use.

APPENDIX 5
PROCESS OF
COMPUTER PLAN DEVELOPMENT

PROCESS FOR DOCUMENT DEVELOPMENT

The preparation of the Computer Plan 1987-1989 extended over six months. In the first stage, the status of computer use in Peel was determined through a series of questionnaires.

- Each principal completed a thorough assessment of the situation at his/her school with respect to computer use, including: an inventory of what the equipment was being used for; the level of staff readiness and involvement in computer use; details about school management of computers and perceptions of the value of computer support services.
- Representative teachers -- both regular and infrequent users of computers -- from each school completed a questionnaire intended to assess personal and professional attitudes to computer use, level of training, and observations related to classroom use.
- Resource teachers were also asked to provide information about their observations of the level and quality of use of computers in the schools in which worked.

The resulting data were summarized in the Preliminary Paper on the Report on the Status of Computer Use in Peel Schools which was presented to the Program Committee of the Board on June 6, 1986. That Report, amended to reflect 1986 budget purchases, is part of this document (Appendix 2).

The second stage of development of the Computer Plan 1987-1989 began with the selection of a 10-person Steering Committee. The purpose of the committee was to gather background information, discuss the major strategy issues and then to give directions to the writing team.

Each of the committee members took responsibility for one major component of the Plan. They each set up a sub-committee with particular expertise on issues related to that component. The task of the sub-committees was to prepare a set of recommendations on those specific issues to provide input to the Steering Committee and the writing team.

Steering Committee

John Amon	Steven Lee	Doug Rose	Peter Swalwell
Jane Barnes	Larry Mason	Laury Roy	Jo Ann Wilton
Chris Bridge	Dean Miller		

Sub-committee members:

Claudia Akins	Brian Hawryluk	Roy Murray
Sheila Allin	Dayne Honsberger	Bev Noble
Alikki Arro	Susan Hughes	Alex Norrie
John Beaton	Kathy Inglis	Pat Page
Rob Beer	Don Jones	Bill Quance
Fran Bederman	Nancy Kugler	John Rennie
Don Brown	Keith Knapp	Cam Robinson
Judy Clift	Lily Kretchman	Dan Salisbury
Daryl Cook	Mary Jean Lambert	Floyd Selves
Tony da Silva	Debbie Lang	Bruce Silzer
Gary Ewart	Steve Martinello	Barb Smith
Dale Green	Pat McCarthy	John Smith
Joan Habib	John McGuigan	Wenda Watt
Lynn Haddad	Roger McMahon	Bruce Yama
Doreen Hausman	George Murray	

APPENDIX
GLOSSARY

Glossary of Terms

Cabling	Networked computers have to be connected to each other and to the fileserver. The components in a network do not have to be in close proximity and cables between computers can be over 100 metres. The cables can be laid above the ceiling tiles in a school and allow computers throughout the school to be linked together.
CHOICES	The two stage software package (CHOICES I for elementary grades and CHOICES II for secondary school students) helps students identify personal directions for employment and preparatory education. All guidance counsellors in Peel schools from grade 7 to OAC now have access to CHOICES for the use of their students.
CoSy	The name CoSy is derived from the two words 'communication system' and is a conferencing system developed at the University of Guelph. It is currently being piloted by the Ministry of Education and TVOntario as a component of a province-wide communication network for school boards. Peel is one of 75 pilot sites.
DSS	Distributed Secondary System is a project to connect all Peel secondary schools to the administrative functions of the Board mainframe computer. Almost all secondary school have now got the equipment and the range of possible administrative activities is expanding as the necessary software is completed.
DES	Distributed Elementary System is a similar project to link elementary schools to the Board-wide student data base. It is currently at the pilot stage.
Fileserver	One of the benefits of computer networks is that the individual computers can share a large storage area such as a fileserver. In the GEM networks, the fileservers also add to the intelligence of the network by enabling communication among computers and by adding extra features which an individual computers could not have.
GEM	Grant Eligible Microcomputer (GEM) refers to those computers which meet Ministry of Education criteria for instructional computers and therefore qualify under the R.E.E. grant structure.
INFO GLOBE	Since 1977, the Globe and Mail newspaper has been typeset from computer data files. Those files have been saved and are added to each day as the next paper comes out. The accumulated files can be searched to retrieve articles dealing with selected topics or events. All Peel secondary schools have the capability to access this data base for student research.
Keyboarding	The term is used in more than one context but simply refers to the skill of entering text through a keyboard. As Business Education departments acquire computer equipment to use in place of typewriters, there is a tendency to refer to those courses as keyboarding although much more than simple text entry is involved.
Licensing	Software costs can be significantly reduced and distribution simplified by paying once for the right to use a particular program in all Peel schools. Such licensing agreements are even more important when the software is to be run on networks of computers where we would otherwise have to pay by each computer on the network.
LOGO	LOGO is an interactive computer language which allows students to solve problems in creative and graphic ways. It is easy and fun for students to learn to work with but it requires special training for teachers who want to build the problem solving into their classroom activities in an effective way.
Networking	Networking involves the linking together of a number of computers and printers to a fileserver. Networking increases the storage space available and therefore the number and size of programs which can be stored. Good quality networks

significantly expand the resources available to any single station on the network and allow communications between user stations.

PENIBB

Peel Educational Network and Integrated Bulletin Board is a software package developed in the Program Department. PENIBB is being used to allow different groups of teachers to exchange information for tasks which are inefficient if done either by telephone or in print. At a later time PENIBB can be used to allow groups of students to communicate between classrooms. Peel currently is marketing PENIBB to other boards in Ontario.

RBCS

Remote Broadcasting Communication System is a package of communication software developed to allow information to be exchanged between ICON sites. It was designed for the State of Maryland and is being piloted in Ontario as a method of transferring reasonably large sets of data, eg. for the distribution of software. Peel is involved in the pilot.

R.E.E. Grants

A special Recognized Extraordinary Expense Grant has been set up by the Ministry of Education to assist school boards with the purchase of computer equipment. The rates of coverage are the same as for other R.E.E. grants but can only be used for the purchase of GEMs.